

CHASE NEWS

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BASF Sponsors Metrolina Seminar

BASF has been conducting a series of meetings across the US highlighting use of Pageant Intrinsic fungicide. The final scheduled meeting was at Metrolina Greenhouses in North Carolina in the middle of last month. Speakers included me, Steve Larson (above left), Kathie Kalmowitz (above right photo on the left) and Margery Daughtrey (above right photo on the right).

Steve is the national sales manager for ornamentals. He presented the most current information on using Pageant Intrinsic for plant health benefits including how they believe the active ingredient - pyraclostrobin - works in the plant.

Dr. Kathie Kalmowitz (Technical Manager for Turf and Ornamentals) presented quite a bit of the research that BASF has performed to investigate the plant health benefits of Pageant. They have completed several years of in house research as well as working closely with outside researchers including Paul Pilon (Perennial Solutions). Paul is writing a series of articles for **Chase News** on his extensive field trials on cold protection, drought protection and rooting with Pageant starting next month.

BASF studies have determined the physiological pathways that is responsible for the “plant health” benefits of pyraclostrobin. There is an interaction between the active ingredient and the species and perhaps even cultivar of the plant which determines what benefit you see. At the present they have focused on crops that show the response most consistently like impatiens and pansy.

Since I am still a plant pathologist, I presented an overview of some characteristics of Pageant use as a fungicide including:

- broad-spectrum activity
- longevity (sometimes up to 2 months)
- crop safety
- eradicator ability on some diseases
- efficacy against tough diseases (like black spot on rose, anthracnose and Sclerotinia blight)
- efficacy without adjuvants

Finally Margery (Senior Extension Specialist and Cornell University’s Long Island Horticultural Research

and Extension Center on Long Island) and I shared a series of talks on some of the most serious diseases of ornamentals from powdery mildew to *Phytophthora* and then downy mildew.

The final presentation focused on the newest products from BASF including Orvego which is a new fungicide combining the ai in Stature SC (dimethomorph) with a new MOA group active ingredient - ametoctradin (MOA 43). Both active ingredients are very effective on *Phytophthora* spp. and downy mildew fungi, making this premix an ideal management tool for prevention of resistance.

After lunch we toured the vast facility and finally visited an extensive trial garden managed by Mark Yelanich.

Marge and I enjoyed the beautiful flowers, occasional disease and butterflies. We also took some time to discuss our newest book project which is a **Compendium of Bedding Plant Diseases and Pests** (Dr. Ray Cloyd from Kansas State University is our collaborator on this project). The book will be published by APS Press hopefully in late 2013 or early 2014. But first, of course, we do have to start writing it.

Late Summer Diseases

I have been traveling all over the country these past three or four months and regardless of where I go, I am seeing some of the signs that summer is starting to close and fall begin.

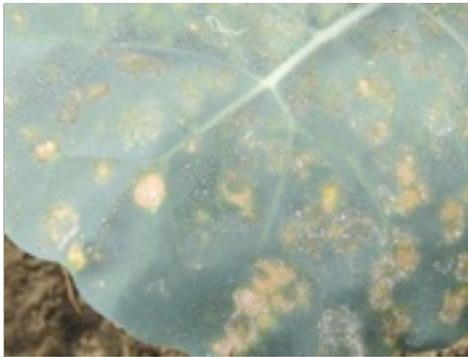
DOWNY MILDEW

In coastal California, I saw typical downy mildew on a number of crops including broccoli and snapdragon. The weather along the Pacific Coast is almost always ideal for downy mildew. Fog rolls in every day and while it may burn off mid day it is often back in late afternoon. Downy mildew on most plants thrives on high humidity and cool to warm temperatures.

Moving into the mid-Atlantic states where the weather is quite different in the late summer still showed downy mildew as very common. In this area, the downy mildew fungi are not deterred by heat but require only a susceptible host plants and a lot of rainfall or overhead irrigation. In North Carolina, I saw my first case of impatiens downy mildew and also quite an impressive array of symptoms of downy mildew on coleus. Both of these downy mildew fungi attack plants all over the country when it is warmer than we would have expected ideal for downy mildew diseases. Over the past ten years we are having to rethink our idea of what weather promotes downy mildew.

POWDERY MILDEW

Powdery mildew is also common as fall starts. The warm days and cool nights lead to condensation on leaves overnight which favor powdery mildew. When conditions are ideal the mildew forms on all plant surfaces including stems (dahlia - below), leaves, flowers and petioles.



Downy mildew on broccoli -
typical blotchy spots from top of leaf



Downy mildew on snapdragon -
grey spores on leaf undersides



Downy mildew on coleus -
blotches are not variegation but rather appearance of lesions



Downy mildew on impatiens
white spores coat leaf undersides

TOSPOVIRUS

As the summer crops are harvested and insects seek a new home, they often invade our growing areas. Thrips are common invaders from the AG world and they can carry Tospoviruses including INSV (impatiens necrotic spot virus) and TSWV (tomato spotted wilt virus). Be especially vigilant as the fall progresses for invasions of these insects.



Tospovirus (TSWV) on Dahlia

PHYTOPHTHORA SUDDEN DEATH

One sure sign that summer is ending is the sudden death of certain crops. As the fully grown (sometimes overgrown) crops like *Coleonema*, *Lavandula* and *Rosamarinus* face hot days with excess water, infections with Phytophthora can lead to a rapid decline and death. The plants require more water - usually from overhead, due to poor water holding capacity of the pot which is filled with roots. One grower in California beat this problem brought on by over-watering by placing his lavender in light shade making the need for water to cool plant roots minimal. This method proved far more effective than a very rigorous fungicide regime.



**Phytophthora sudden death on
Coleonema**

Liverwort Management Program

As a result of a concerted effort by weed scientists and IR-4 the following people put together an information sheet on liverwort control: K. Hester, C. Palmer, E. Beste, M. Czarnota, J. DeFrancesco, J. Derr, R. Frank, T. Freiberger, C. Gilliam, H. Mathers, E. Peachey, M. Reding, A. Senesac, C. Wilen. I decided to quote it completely to avoid mistakes I might make in interpretation.

“Liverwort or *Marchantia polymorpha* has become a successful pest in many ornamental greenhouse and nursery production sites. A national survey of growers by the Society of American Florists ranked liverwort No. 7 on the list of worst nursery weeds. In Oregon, it is now widely regarded as the No. 1 container nursery weed problem. In addition to being aesthetically unpleasing liverwort mats on pots can reduce water and nutrient uptake thus reducing crop production, as well as, harboring vectors of disease such as fungus gnats.

These non-vascular plants can propagate sexually through spore production or asexually by producing gemmae. Clones easily break off the parent and can be splashed around by water. Therefore, preventative control and good cultural practices, as well as, preemergent and postemergent control are appropriate.

Prevention: Inspect all new plant material as it comes into the facility; reject material that has known infestations of liverwort or thoroughly hand weed.

Sanitation: Good sanitation can reduce spore load. Remove contaminated plants, pots/flats, growing media from the greenhouse/nursery and surrounding area.

Cultural Control: Liverwort thrive in warm moist locations with ample nitrogen and phosphorus. Where possible use water conserving types of irrigation such as drip irrigation and avoid overhead or sprinkler irrigation. Allow plants to dry out in between watering. Use loose growing media with good drainage to help manage soil moisture and maintain good ventilation to lower ambient humidity. Increasing pot spacing or opening greenhouse sidewalls will increase air circulation. (Atland) Since liverwort live on the surface of the potting media managing fertilizer efficiently may reduce

nitrogen availability to this pest. Incorporating fertilizers or dibbling beneath the root ball rather than topdressing will reduce nutrient concentration on the soil surface. Fast drying mulches can also slow down infestations.

Chemical Control: The decision to use a herbicide and which one requires consideration of various factors such as location (greenhouse or field), application type (over the top vs. directed spray), conventional or organic practices, length of control needed, skilled/non- skilled labor, severity of the infestation and crop/variety.



Preemergence: Many preemergence herbicides commonly used in nurseries provide significant control of liverwort although none are currently registered for use on containers in greenhouses/ covered structures. Among the preemergence herbicides evaluated at Auburn University (2004), Ronstar (oxadiazon) and BroadStar (flumioxazin) provided the best control. In 2005, Ahrens also reported preemergent applications of flumioxazin effectively controlled liverwort, pearlwort, and mosses.”

Their second table on post-emergence herbicides for liverworts has quite a bit of information that I cannot include here. I have included all of the products with as much of the information as possible on their use.

You will note that many of the post-emergence products are non-selective which of course means they are not safe over the top of ALL crops. Be sure t always follow the label carefully to avoid crop damage and breaking the law.

| TRADE NAME | RATE/A | COMMENTS |
|-------------------------|-------------|------------------------------|
| WeedPharm | 20-30% v/v | non-selective, Danger label |
| EmoryAgro 7010 (=Racer) | 5% v/v | non-selective, Warning label |
| Tower | 3 lb ai | Selective, Warning label |
| AvengerAG | 20% v/v | Non-selective, Caution label |
| SureGuard | 0.375 lb ai | Selective, Caution label |
| Bryophyter | 2% v/v | Non-selective, Caution label |
| Scythe | 5-10% v/v | Non-selective, Warning label |

| PREEMERGENCE AI | PRODUCT TRADE NAME | PRODUCT RATE/A |
|----------------------------------|------------------------|-----------------|
| dimethenamid-p | Tower | 21-32 fl oz |
| dimethenamid-p and pendimethalin | Freehand | 200 lb* |
| flumioxazin | Broadstar SureGuard | 150 lb 12 oz |
| oxadiazon | Ronstar 2G | 150 lb |
| oxadiazon and pendimethalin | Regal O-O | 100 lb |
| oxyfluorfen and pendimethalin | OH2 | 100 lb |
| oryzalin and oxyfluorfen | Rout | 100 lb |
| * - not controlled in California | | |

State of Fungicides for Pythium on Ornamentals

Although there have been a multitude of new products for Phytophthora and downy mildew over the past five years, almost no ground has been gained in the fight against Pythium diseases. A few years ago, IR-4 determined that they would support trials on Pythium control for several years and came out with a summary of that work in the middle of 2011. I have used the summary many times and appreciate the efforts made by Vea and Palmer in summarizing this work.

Just this week, I noticed a summary table that really showed the sad state of affairs we face when choosing a product to control this common and so variable disease. Symptoms can include:

- stem rot - called black leg at times
- chlorosis - yellowing - especially on lower leaves
- stunting
- wilting - can recover overnight sometimes
- loss of lower leaves
- poor root development
- root loss - outer core can die leaving just the core

Unfortunately very few products really give us better than 50% control of Pythium root rot. The Pythium species included in the IR-4 trials were: *aphanidermatum*, *dissoticum*, *irregulare*, *mammilatum*, *ultimum* and *vipa*.

The best product overall was Terrazole at 92% control in 8 trials with Subdue MAXX providing an average of 65% control in 21 trials. Both of these products are industry standards. Although both have been used for over 30 years, resistance has not developed to etridiazole (ai for Terrazole and Banrot). In contrast, resistance to mefenoxam in Pythium isolates has been reported consistently over the past 18 years.

One of the newest fungicides for Oomycetes (includes *Pythium*, *Phytophthora* and the downy mildew fungi) is Adorn. Interestingly, Adorn showed 64% Pythium control in 25 trials. This product must be tank-mixed with another MOA group fungicide for any use.

Strobilurins (MOA 11) provide varying levels of control but can reach the 50% mark. Finally, Segway (MOA 21) provided an average of 56% control in 21 trials.

Many growers rely on use of phosphonates (MOA 33) like Aliette and Alude. The IR-4 trials show that Aliette and Alude also provide about 50-58% control.

The biological control product most often used for soil-borne diseases like Pythium root rot is RootShield. BioWorks recently introduced RootShield Plus which has two different fungi (*Trichoderma harzianum* T-22 and *T. virens* G-41). The IR-4 trials show rather poor results with this new formulation. In most cases control is less than acceptable with an average of 23%. Trials run at Chase Horticultural Research, Inc. showed

IR-4 trials for Pythium disease control

| PRODUCT (MOA) | PERCENT CONTROL | NUMBER OF TRIALS |
|----------------------------|-----------------|------------------|
| Adorn (43) | 64 | 25 |
| Aliette (33) | 58 | 14 |
| Alude (33) | 50 | 5 |
| Disarm O (11) | 41 | 12 |
| FenStop (11) | 50 | 19 |
| Heritage (11) | 53 | 32 |
| Insignia (11) | 54 | 5 |
| Kocide 2000 (M1) | 34 | 5 |
| Micora (40) | 39 | 8 |
| Pageant (11 and 7) | 35 | 12 |
| RootShield Plus (44 and ?) | 23 | 11 |
| Segway (21) | 56 | 15 |
| Subdue MAXX (4) | 65 | 21 |
| Terrazole (14) | 92 | 8 |

similar results with no significant control in most trials. We actually had excellent control in only two trials - *Pythium aphanidermatum* on poinsettia (once only) and in one trial on Phytophthora root rot on vinca. The results on Fusarium diseases and others are shown on the next page.

Conclusions

At this point the most effective products are those that include:

- etridiazole (Terrazole, Truban and Banrot)
- mefenoxam (Subdue MAXX - resistance is possible)
- fluopicolide (Adorn - remember to follow label directions to tank mix with another effective fungicide)
- phosphonates (Aliette, Alude and many others - I have seen these work only 50% of the time against Pythium root rot in our own trials)
- strobilurins (Disarm O, Heritage, Insignia) OR fenamidone (FenStop - use lower end of label rates to avoid possible root damage that can be confused with root rot).

The efficacy with biologicals remains low and inconsistent. As always read labels BEFORE use and rotate between MOA groups. These are the two most important ways to get the most out of your fungicide dollars.

Efficacy Trials for RootShield Plus

I have been asked multiple times over the past two months about using RootShield Plus and I decided to review our trials as well as the rest of those I could find. Use rates were 4-6 oz/100 gal as a drench applied once before inoculation.

The diseases we tested were mainly Pythium but several trials on Phytophthora, Rhizoctonia, Fusarium and even *Thielaviopsis* (Black root rot).

On the previous page, I reviewed IR-4 trials on fungicides for control of Pythium diseases on ornamentals. The only biological control agent I mentioned was RootShield Plus since the few others included in the IR-4 trials were not widely tested or are not registered yet.

The average control in the 11 IR-4 trials on Pythium disease was 23% control. We also performed *P. aphanidermatum* root rot on poinsettia with excellent control. Two trials on celosia with damping-off by either *P. irregulare* and *P. ultimum* yielded results with no control in either trial. The stem rot trials with *Phytophthora parasitica* on vinca strangely enough showed no control in one trial and excellent control in another trial. Plants from the trial that had severe disease pressure are shown in the picture below. The first trial had very severe stem and crown rot while the second trial showed root rot only. Plants from the trial are shown in the picture below. In the other trial % good roots for the noninoculated control plants

74% with inoculated plants were an average of 65%. The RootShield Plus had 76% roots which was indeed very good. Apparently under low disease pressure, the product may work better which is not surprising.

Rhizoctonia damping-off on celosia was also tested with no control at all. In one trial on black root rot on pansy (*Thielaviopsis basicola*) no control was seen with RootShield Plus.

For Fusarium we performed one trial on lisianthus (*F. oxysporum*) with no control. IR-4 trials showed the following results for Fusarium diseases:

- Dracaena stem rot caused by *F. solani* - very good control
- Delphinium crown rot caused by *F. oxysporum* - some control
- *F. communi* damping-off on Douglas fir - no control in two trials.

Unfortunately, I cannot report there is much evidence that this new combination of biological control agents is very effective on any of these soil-borne fungi. If you use biological controls preventatively and under conditions that are not highly favorable for disease you can obtain some good control.



Healthy (A) and inoculated (B)

RootShield Plus G and WP (I thru L)



Thoughts from Mike

Well I've been working on our videos now for a few months, I've found out that it's not so easy. What you see in a 3 - 5 minute video takes several hours to produce (if quality is what you are after). Our aim is to still have around 20 videos on our subscription YouTube channel by the end of the year. We will keep adding to the public channel as often as possible.

On another topic, for those of you who may not have heard, we have decided to expand the newsletter with other researchers contributions, including some bug entomology and weed science. We will also include some spanish as well. So you can see we will be making a huge change in the newsletter content and layout. If you have any topics you think we could include or researcher or extension scientists we could invite to participate let us know.

I'm excited! I'll give you a heads up when we get to that point.

Mike



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